

Chemical Composition & Magnetic Properties

MMPA Brief Designation	IEC Code Reference	Chemical Composition*	Magnetic Properties (nominal)			
		Alloys	Max Energy Product (BH) max (MGO)	Residual Induction Br (kilogauss)	Coercive Force H _c (oersteds)	Intrinsic Coercive Force H _{ci} (oersteds)
5/16	R5-1	SmCo ₅	5	4700	4500	16000
14/14	R5-1	SmCo ₅	14	7500	7000	14000
16/18	R5-1	SmCo ₅	16	8300	7500	18000
18/20	R5-1	SmCo ₅	18	8700	8000	20000
20/15	R5-1	SmCo ₅	20	9000	8500	15000
22/15	R5-1	SmCo ₅	22	9500	9000	15000
22/12	R5-2	SmCo ₁₇	22	9600	8400	12000
24/7	R5-2	SmCo ₁₇	24	10000	6000	7000
24/18	R5-2	SmCo ₁₇	24	10200	9200	18000
26/11	R5-2	SmCo ₁₇	26	10500	9000	11000
28/7	R5-2	SmCo ₁₇	28	10900	6500	7000

Physical and Thermal Properties Sintered Samarium Cobalt Magnets

	1-5 Alloys	2-17 Alloys
Mechanical Properties:		
Modulus elasticity	23 x 10 to the 6th power PSI	17 x 10 to the 6th power PSI
Ultimate tensile strength	6 x 10 to the 3rd power PSI	5 x 10 to the 3rd power PSI
Physical Properties:		
Density	8.2 g/cc	8.4 g/cc
Coefficient of thermal expansion		

23,000 psi (PSI)

OR 158.58
(GPa)

Perpendicular to orientation	13×10 to the -6th power/ $^{\circ}\text{C}$	11×10 to the -6th power/ $^{\circ}\text{C}$
Parallel to orientation	6×10 to the -6th power/ $^{\circ}\text{C}$	8×10 to the -6th power/ $^{\circ}\text{C}$
Electrical resistivity	53 μ ohm cm.	86 μ ohm cm.
Magnetic Properties:		
Curie temperature	750 $^{\circ}\text{C}$	825 $^{\circ}\text{C}$
Reversible temperature coefficient		
of residual induction (-100 $^{\circ}\text{C}$ to + 100 $^{\circ}\text{C}$)	-043%/ C	-03%/ C
Recoil permeability	1.05	1.05
Max. Service temperature*	250 $^{\circ}\text{C}$	300 $^{\circ}\text{C}$

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Web Pages Created By: Joel Alvarez

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• 23000000 pounds per square inch (psi) (lb/in²)
converts to
158.579411000000000 gigapascal

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Periodic Table

Element List

by Name

by Symbol

by Atomic Number

by Atomic Weight

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Cobalt

27	Atomic Number	27
Co	Atomic Weight	58.9332
58.9332	Electron Config.	2-2-6-2-6-7-2

Electron configuration order: 1s-2s-2p-3s-3p-3d-4s-4p-4d-4f-5s-5p-5d-5f-6s-6p-6d-7s
Mechanical Properties**Conditions****Phase Temp. (K) Pre**

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 $3 \times 10^7 \text{ PSI}$ or

Density	8860 kg/m ³	Solid	298.15
Modulus of Elasticity	206.843 GPa	Solid	0
Poisson Ratio	0.31	Solid	
Thermal Expansion Coefficient	$1.300 \times 10^{-5} / \text{K}$	Solid	298.15

Electrical Properties**Condi****Temp. (K)**

Electrical Resistivity	$6.240 \times 10^{-8} \Omega\text{-m}$	293.15
------------------------	--	--------

Thermal Properties**Conditions****Temp. (K) Press**

Melting Temperature	1768.15 K	10
Boiling Temperature	3200.15 K	10
Critical Temperature	6300 K	
Fusion Enthalpy	275 J/g	0 10

Heat Capacity	421 J/kg-K	298.15 more...	10
Thermal Conductivity	100 W/m-K	300	10

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gigapascal

Symbol: GPa
Category: Pressure
SI Equivalent: 1×10^9 Pa
Dimension: $ML^{-1}T^{-2}$
System: SI

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 44 conversions, showing those commonly used | [Show all](#)

206.843 GPa =

Symbol	Pressure Unit Name
2.04138×10^6 atm	atmosphere (standard)
2.06843×10^6 bar	bar
1.55145×10^8 cmHg (0 °C)	centimeter of mercury (0 °C)
2.10927×10^9 cmH ₂ O	centimeter of water (4 °C)
2.06843×10^{12} dyn/cm ²	dyne per square centimeter
6.92018×10^7 ft H₂O	foot of water (4 °C)
6.10808×10^7 inHg (0 °C)	inch-of-mercury (0 °C)
8.31211×10^8 inH ₂ O (15.56 °C)	inch of water (15.56 °C)
2.10921×10^6 kgf/cm²	kilogram force per square centin
2.10921×10^{10} kgf/m ²	kilogram force per square meter
3×10^4 kip/in², ksi, KSI	kilopound force per square inch
2.06843×10^5 MPa	megapascal
2.06843×10^9 mbar	millibar
2.06843×10^{11} Pa, N/m ²	pascal
4.32001×10^9 lbf/ft ²	pound force per square foot
3×10^7 psi, PSI, lbf/in²	pound force per square inch
1.55145×10^9 torr	torr

more...

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Introduction

Properties of common **solid** materials are divided into following categories:

- Physical properties: Density, melting and boiling temperature.
- Mechanical Properties: Including basic mechanical properties, such as elastic modulus, shear modulus, Poisson's ratio, and mechanical strength properties such as yielding stress, ultimate stress, elongation.
- Thermal Properties: Coefficient of thermal expansion, thermal conductivity.
- Electric Properties: Electric resistivity.
- Acoustic Properties: Compression wave velocity, shear wave velocity, bulk wave velocity.

- Note:
1. All properties are under **1 atm** (1.01325×10^5 Pa; 760 mmHg; 14.6959 psi) and at room temperature **25 °C** (77 °F) unless specified otherwise.
 2. Further information on a specific material can be obtained by clicking the **name** of that particular material in the following table.
 3. Users who prefer Standard or other unit systems rather than the SI system, click the **amount** (number) of the specific material property for conversion.
 4. Materials in different phases at room temperature: **Liquid**, **Gas**

Basic Mechanical Properties

Material	Elastic Modulus (GPa)	Shear Modulus (GPa)	Poisson's Ratio
Aluminum [Al]	70	26	
Aluminum Alloy	70 - 79	26 - 30	
Brass	96 - 110	36 - 41	

Brass; Noval	100	39	
Brass; Red (80% Cu, 20% Zn)	100	39	
Brick (Compression)	10 - 24	-	
Bronze; Regular	96 - 120	36 - 44	
Bronze; Manganese	100	39	
Carbon [C]	6.9	-	
Ceramic	300 - 400	-	
Concrete	18 - 30	-	0.
Copper [Cu]	110 - 120	40 - 47	0.3
Copper Alloy	120	47	
Cork	-	-	
Glass	48 - 83	19 - 34	0.2
Gold [Au]	83	-	
Iron (Cast)	83 - 170	32 - 69	0.
Iron (Wrought)	190	75	
Magnesium [Mg]	41	15	
Magnesium Alloy	45	17	
Monel (67% Ni, 30% Cu)	170	66	
Nickel [Ni]	210	80	
Nylon; Polyamide	2.1 - 2.8	-	
Platinum [Pt]	145	-	
Rubber	7.0×10^{-4} - 4.0×10^{-3}	2.0×10^{-4} - 1.0×10^{-3}	0.4
Silver [Ag]	76	-	
Solder; Tin-Lead	18 - 35	-	
Steel	190 - 210	75 - 80	0.2
Stone; Granite (Compression)	40 - 70	-	0.
Stone; Limestone (Compression)	20 - 70	-	0.
Stone; Marble (Compression)	50 - 100	-	0.
Tin [Sn]	41	-	
Titanium [Ti]	110	40 - 40	
Titanium Alloy	110 - 120	39 - 44	
Wood; Ash (Bending)	10 - 11	-	
Wood; Douglas Fir (Bending)	11 - 13	-	

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Samarium

(ALONE)

62

Atomic Number

62

Sm

Atomic Weight

150.36

150.36

Electron Config.

2-2-6-2-6-10-2-6-10-6-2-6-0-0-2

Electron configuration order: 1s-2s-2p-3s-3p-3d-4s-4p-4d-4f-5s-5p-5d-5f-6s-6p-6d-7s

Conditions

Mechanical Properties

Phase Temp. (K) Pres

Density

7520 kg/m³

Solid

298.15

Modulus of Elasticity

55.158 GPa

Solid

0

Poisson Ratio

0.27

Solid

Thermal Expansion Coefficient

1.270 × 10⁻⁵ /K

Solid

298.15

Electrical Properties

Conditio

Temp. (K)

Electrical Resistivity

8.800 × 10⁻⁷ Ω-m

298.15

Thermal Properties

Conditions

Temp. (K)

Pressu

Melting Temperature

1345.15 K

101

Boiling Temperature

2063.15 K

101

Critical Temperature

5050 K

Fusion Enthalpy

57.3 J/g

0

101

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7.99 × 10⁴
PSI

Heat Capacity	197 J/kg-K	298.15	100
Thermal Conductivity	13.3 W/m-K	300	101



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Symbol: GPa
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System: SI

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55.158 GPa =

Symbol	Pressure Unit Name
5.44367×10^5 atm	<u>atmosphere (standard)</u>
5.5158×10^5 bar	<u>bar</u>
4.13719×10^7 cmHg (0 °C)	<u>centimeter of mercury (0 °C)</u>
5.62471×10^8 cmH ₂ O	<u>centimeter of water (4 °C)</u>
5.5158×10^{11} dyn/cm ²	<u>dyne per square centimeter</u>
1.84538×10^7 ft H₂O	<u>foot of water (4 °C)</u>
1.62882×10^7 inHg (0 °C)	<u>inch of mercury (0 °C)</u>
2.21656×10^8 inH ₂ O (15.56 °C)	<u>inch of water (15.56 °C)</u>
5.62455×10^5 kgf/cm²	<u>kilogram force per square centim</u>
5.62455×10^9 kgf/m ²	<u>kilogram force per square meter</u>
7999.99 kip/in², ksi, KSI	<u>kilopound force per square inch</u>
5.5158×10^4 MPa	<u>megapascal</u>
5.5158×10^8 mbar	<u>millibar</u>
5.5158×10^{10} Pa, N/m ²	<u>pascal</u>
1.152×10^9 lbf/ft ²	<u>pound force per square foot</u>
7.99999×10^6 psi, PSI, lbf/in²	<u>pound force per square inch</u>
4.13719×10^8 torr	<u>torr</u>
more...	

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$\approx \text{GPa}$

Soft cuticle of pregnant locust	30
Rubber	1000
Shell membrane of egg	1100
Human cartilage	3500
Human tendon	80,000
Wallboard	200,000
Unreinforced plastics, polyethene, nylon	200,000
Plywood	1,000,000
Wood (along grain)	1,000,000
Fresh bone	3,000,000
Magnesium Metal	6,000,000
Ordinary glasses	10,000,000
Aluminum Alloys	10,000,000
Brasses and Bronzes	17,000,000
Iron and Steel	30,000,000
Aluminum Oxide (sapphire)	60,000,000
Diamond	170,000,000